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RESEARCH ARTICLE

ETHNOBOTANICAL STUDY OF ENDOGENOUS METHODS USED FOR THE TREATMENT OF DISEASES OF SOMBA CATTLE BREED IN NORTHERN BENIN**Tiropa Francis CHABI CHINA^{1*}, Pascal Abiodoun OLOUNLADE^{2,3}, Sahidou SALIFOU⁴**¹Faculté des Sciences Agronomiques, Université d'Abomey-Calavi, 01 BP 526 Cotonou, Bénin²Laboratoire Pluridisciplinaire, Ecole Nationale Supérieure des Sciences et Techniques Agronomiques de Kétou, Université d'Agriculture de Kétou BP: 95 Kétou, Bénin³Conseil Ouest et Centre Africain pour la Recherche et le Développement Agricoles, 7, Avenue Bourguiba Dakar-Sénégal⁴Ecole Polytechnique d'Abomey-Calavi, Université d'Abomey-Calavi, Département de Production et de Santé Animale. BP: 2009 Cotonou, Bénin*Corresponding author: tiropaacc@yahoo.fr**ABSTRACT**

This study aims to identify and catalog the plant species and medicinal plant recipes used in the treatment of bovine Somba diseases in the north of Benin. To this end we realized an ethnobotanical investigation based on semi-structured individual and group interviews, targeting Somba cattle farmers in northern Benin. The results indicate that 37 plant species are used in 45 different recipes for treating diseases of Somba cattle. These recipes are based on different parts or organs, which mainly consist of leaves and barks. Decoction and maceration are the predominant modes of preparation, and the oral route of administration is most used method. These recipes are used to treat 25 different diseases or syndromes, predominantly parasitic diseases. Plant species listed are divided into 29 different botanical families, of which the most important are the Fabaceae, the Anacardiaceae, Meliaceae, Asteraceae, Euphorbiaceae, and Moraceae. As the most used plant species, they comprise 11 of 37 listed.

Key words: bovine - Somba – medicinal plant – diseases - treatment**1. INTRODUCTION**

The Somba cattle breed belongs to the group of shorthorn cattle of West Africa. Although recognized as rustic and trypanotolerant, these taurine, given their small size, attract little interest from farmers who prefer larger cattle such as longhorn taurine and zebu. As a result, the number of shorthorn livestock in West Africa has experienced significant decrease over time (Dossa, 2000; PAMRAD, 2006; Sokouri et al., 2009).

In the Republic of Benin, the Somba cattle have not escaped this phenomenon. Indeed, the Somba cattle livestock decreased from 75,000 head in 1986 (Saw et al., 1987; Hall et al., 1995) to 26,000 in 1997 (Dossa, 2000; Moazimi et al., 2001) and 17,000 in 2006 (PAMRAD, 2006). With the exception of PAMRAD, these authors, as in the case of taurus Lagunaire and Baoule, index absorption by the zebu as the main cause of the decline of the race.

But unlike these previous studies, the recent work of Chabi China et al. (2013) on the zootechnical parameters of the Somba breed suggests the very high mortality (about 16% per year) as being largely responsible for the continued decline of livestock recorded, because especially that 96% of the cattle in the area are somba.

Indeed, this study reveals a near-total absence of health care, both preventive and curative, to Somba cattle, which causes an excessively high mortality especially among young animals, who are more vulnerable. The high cost of veterinary products and the unavailability of veterinary agents are the main reasons given by farmers to justify this bad health management of their livestock. However, many of them expressed an awareness and use of alternative methods including endogenous practices of bovine diseases treatment based on plants.

In order to significantly reduce the excessive mortality and limit the drastic fall in the number of endangered Somba livestock, it is essential to consider these alternatives to modern veterinary medicine to give them a scientific backing and establish a repository for use, in particular in terms of preparation methods, forms of use, doses, degree of toxicity, therapeutic indications, etc.

In the Republic of Benin and the subregion many ethnobotanical studies of medicinal plants were conducted (Adjanohoun et al., 1989; Tamboura et al., 1998; Delvaux et al., 2009; Etuk et al., 2010; Allabi et al., 2011; Déléké-Koko et al., 2011; Dibong et al., 2011; Fah et al., 2011; Dossou et al., 2012; etc.). These studies

have often focused on traditional human and veterinary medicine as a whole. However, none of these studies has focused on the medicinal plants used in the Somba cattle specifically, especially in its natural environment, the area northwestern Benin and northeastern Togo.

This lack of focused studies justifies the realisation of the present ethnobotanical survey of medicinal plants used on the Somba cattle breed in northern Benin.

2. MATERIALS AND METHODS

2.1 Study zone

In the Republic of Benin, the Somba cattle breed is found mainly in the region of Atakora. It is in this northern region that the study was conducted. It took place in the Commune of Boukoubé, which has most of the Somba livestock. The climate is Sudano-Guinean. It is characterized by a rainy season from April to October and a dry season from November to March. The average temperature is around 27°C. Monthly differences are quite pronounced. In March you can record temperatures up to 44°C and below 20°C during the cooler months. Rainfall averages 1.100 mm per year. It should be noted that the orographic configuration of the rugged area significantly influences the climate.

2.2 Data Collection

Data collection consisted of investigations. These investigations were conducted in two phases: a preliminary investigation and the ethnobotanical investigation itself.

♣ The preliminary investigation

This investigation aimed to establish a repertory of Somba cattle breeders who use traditional veterinary medicine for the treatment of their animals. For this purpose, a large sample of 140 farmers of Somba cattle was established.

The investigation was conducted through individual interviews with farmers in the sample. There are structured interviews based on a questionnaire prepared in advance, which also included open questions.

♣ The ethnobotanical investigation

The preliminary investigation has allowed us to obtain a sample of 72 farmers who know and practice traditional methods of veterinary medicine.

The collection was made using the method of individual semi-structured interviews such as that described by Dibond et al. (2011) and taken up by Klotoé et al. (2013). The information covered by the questionnaire included:

- Inventory of plants used in veterinary medicine
- Inventory of diseases or syndromes allegedly treated by these plants

- Plant parts used: bark, roots, leaves, stems, sap, mixture of several parts, etc.
- Use forms: powder, paste, infusion, decoction, maceration etc., and use doses
- How to use: preventive, curative purposes, or both
- Availability, accessibility of each plant cited in the locality
- Other practices used: endogenous methods that are not herbal
- Age and sex of farmers using endogenous methods of treating diseases.

Identification of plants and diseases

♣ The diseases

For our study, we sought the support of veterinary officers of the Communal Center for Agricultural Promotion of Boukoubé. These agents have a thorough knowledge of diseases prevalent in the study area, and local names of these diseases. Thus, on the basis of symptoms and syndromes described by breeders, they formally establish the diseases that relate to each plant cited.

♣ Plants

The herbarium of each vegetal specie cited was constituted.

For widespread plants, well known and easily identifiable, identification was made on the ground using the following documents: Arbonnier (2004) and "The analytical flora of Benin" (Akoègninou et al, 2006).

The identification of other plants was conducted at the National Herbarium of Benin by the genus and species, using the herbariums previously formed on the ground.

♣ Determination of the most used plants

According to the method proposed by the Tramil group (Tramil 4, 1994), and adopted by Deleke Koko et al. (2011), the plants with high frequency of use are those which have been cited by at least 20% of respondents. The use of this method allowed us to identify the most used plants that can be subject to further studies in future work.

♣ Data processing

The raw data recorded on cards were transferred into a database and processed by the statistical software SPSS 12.0.

3. RESULTS

Age and sex of breeders

The study covered 72 farmers practicing endogenous methods of treatment of animal diseases. In this sample, 93.69% were men and 06.31% were women.

In terms of age, the vast majority of these farmers are between 40 and 60 years (Figure 1).

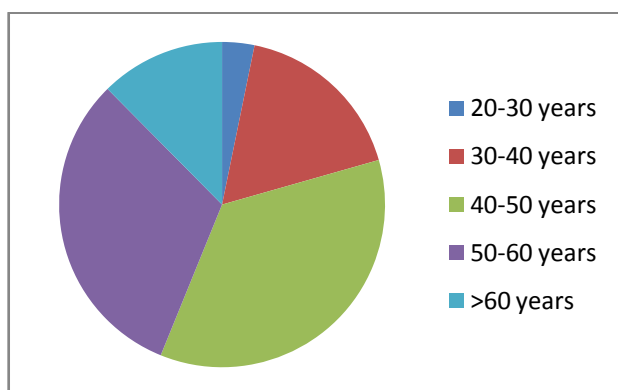


Figure 1: Distribution of farmers by age group.

Diseases treated

This study has identified 25 diseases or groups of diseases, or different syndromes for which the Somba cattle breeders resort to the use of traditional veterinary medicine practices (Table I). Note however that the parasitic diseases are more subject to treatment with endogenous methods. Indeed, parasitic diseases only mobilize 30% of the recipes used in traditional veterinary medicine, so 14 recipes on 45 identified (Table I).

Medicinal vegetal species and recipes for use in treating bovine disease

The present study has inventoried 37 plant species used in 45 different recipes in the treatment of diseases of Somba cattle in the Commune of Boukombé. All of these recipes are herbal, but they usually include mineral elements such as water, salt, potash, and charcoal (Table II).

Table 1: Diseases identified and number of recipes identified for treatment

Diseases	Number of recipes used
Abscess	1
Anemia	1
Anthrax (Prevention)	2
Avitaminosis	3
Brucellosis	1
Constipation/Flatulence	3
Contagious Bovine Pleuropneumonia	1
Defect of appetite	3
Diverse infections	4
Ear diseases/otitis	1
External parasites / Ticks	2
Fatigue/Physical weakness	5
Hemorrhagic diarrhea	2
Internal parasites	12
Leanness	2
Mastitis	1
Ocular diseases	1
Paralysis	1
Pasteurellosis	2
Respiratory deases	2
Simple diarrhea	3
Somnolence	1
Urinary diseases	1
Vomiting	1
Wounds	2

Table 2: Plants utilized in traditional veterinary medicine recipes to treat Somba cattle in northeastern Benin

Plant species	Botanical family	Local name	Therapeutic indications	Parts used	Preparation and administration modes and doses	Frequency of use (%)	Disponibility in the region
Adansonia ditata L.	<i>Bombacaceae</i>	Moutormou	Diarrhoea Pasteurellosis Avitaminosis	Leaves Leaves + fruit	Maceration of leaves +crushed charcoal. Give drink about ¾ L 2 times a day until the diarrhoea stops and for 7 days in the case of pasteurellosis. Maceration of lightly pounded leaves and fruit powder. Give drink "ad libitum."	26.39	High
Adropogon gayanus Kunth.	<i>Paoceae</i>	Kabaku	Febrility, Fatigue	Whole plant	Infusion. Give drink about 1L per day to improve the condition of the animal.	2.78	High
Afzelia africana Sm. & Pers., 1798	<i>Fabaceae</i>	Kparikabou	General bad condition Ocular diseases	Trunk Bark	Infusion. Give drink, "ad libitum" to improve the condition of the animal. Infusion. Wash the eyes of the animal one time a day until recovery.	22.22	Low
Aloe vera (L.) Burm.f., 1768	<i>Aloeaceae</i>		Leanness	Whole plant	Infusion. Give drink about 3/4L per day for at least 7 days	1.39	Very low
Anacardium occidentale	<i>Anacardiaceae</i>	Akaansou	Internal parasites	Nut	Maceration of pounded or lightly crushed nuts. 10 nuts per about 1L of water. Give drink for 3 days.	2.78	High
Azadirachta indica A.Juss., 1830	<i>Meliaceae</i>	Dimou	Diarrhoea Internal parasites Infections	Seeds Leaves	Crush the seeds to extract the oil. Give a small quantity of this oil 2 times a day until the diarrhoea stops. Maceration of lightly pounded leaves. Give drink about 1/2L per day for at least 5 days.	12.5	High
Balamites aegyptica (L.) Del.	<i>Zygophylliaceae</i>	Kpankpakabou	External parasites : ticks	Leaves Trunk bark	Infusion of trunk bark used to wash the animal. Then, pound the leaves and apply on the parts affected. Repeat that for 5 to 10 days.	2.78	High
Blighia sapida	<i>Sapindaceae</i>	Pouroumbou	Respiratory diseases ; cough	Leaves Trunk bark	Infusion. Make the animal breathe in the hot vapour. Then give drink about 1L per day for at least 3days.	9.72	High
Bombax costatum Pellegr et Vuillet	<i>Bombaveae</i>	Fokibou	Prevention of anthrax	Leaves Trunk bark	Maceration. Give drink "ad libitum" for 3days. Repeat that one time a month.	5.56	High
Borassus aethiopum Marth.	<i>Araceae</i>	Yinfa	Urinary diseases Defect of appetite	Fruit	Maceration of pulp of fruit. Give drink about 1L per day during 3 to 7days.	4.17	Low
Bridelia ferruginea Benth.	<i>Euphorbaceae</i>	Munyi	Internal parasites	Leaves Trunk bark	Infusion with added potash. Give drink about ¾ L per day for at least 5days.	22.22	Low
Carica papaya L.	<i>Caricaceae</i>	Dipètori	Internal parasites Constipation	Seeds Fruit	Powder. Give 1 tablespoon of powder mixed with water 2 to 3 times a week for 3weeks. Cut the fruit in pieces and give to the animal to eat.	20.83	High
Centaurea	<i>Asteraceae</i>	Bosèkiro	Infections	Roots	Maceration of roots or leaves. Give drink "ad libitum" for at	6.94	Mean

perottetii		kasibou	Internal parasites, particularly hemoparasites	Leaves	least 3 day. The roots would be more effective than the leaves		
Centaurea senegalensis	<i>Asteraceae</i>	Bosèkiro kasibou	Pleuropneumonia Contagiosa Bovine	Trunk bark	Maceration or powder mixed with drinking water. Give drink "ad libitum" for 5 to 7 days.	2.78	Mean
Cissus quadrangularis L.	<i>Ampelidaceae</i>	Koyanré	Prevention of anthrax	Stem	Crush lightly the stem and leaves to macerate for at least 3 days. Give drink ad libitum for 3 days and repeat often, especially when the disease was reported in the region.	4.17	Low
Cochlospermum tinctorium A. Rich.	<i>Cochlospermaceae</i>	Bousoramou	Hemorrhagic diarrhoea hemorrhagic Hemoparasites	Roots	Maceration of the powder. Give drink about 1L per day for 5 to 9 days.	8.33	High
Cyperus esculatus	<i>Cyperaceae</i>	Tchénsidé	Defect of appetit	Fruit	Crush lightly the fruits and leave to macerate in drinking water. Give drink "ad libitum" for a few days.	4.17	Low
Entada africana Guill. & Perr	<i>Mimosaceae</i>	Fallawanua	Leanness	Trunk bark	Decoction of crushed barks. Give drink about 1/2L per day for 5 to 7 days.	25	High
Fagara xanthoxyloides Lam.	<i>Rutaceae</i>	Karikobou	Constipation Flatulence Abscess	Roots	Maceration of powder. Give to drink, about 1L per day for 2 to 3 days. Powder mixed with water to be applied on and around the abscess.	19.44	High
Ficus exasperata Vahl	<i>Moraceae</i>	Kpanyakissiré	Febrility, Physical weakness	Trunk bark	Infusion. Give drink about 1L per day until the animal regains its condition.	8.33	High
Ficus gnaphalocarpa (Miq) Steud	<i>Moraceae</i>	Mukammou	Internal parasites	Trunk bark	Powder mixed with water. Give drink about 1/2L of the mixture per day for 3 days.	18.05	High
Khaya senegalensis (Ders.) A. Juss	<i>Meliaceae</i>	Kroubou	Defect of appetite Internal parasites	Trunk bark	Powder with a little added salt. Give drink to lap every day. Maceration of crushed (or pounded) bark. Give drink about 3/4L per day for 3 days.	41.66	High
Lannea acida A. Rich.	<i>Anacardiaceae</i>	Mousson	Internal parasites	Trunk bark	Decoction with added potash. Give drink about 1/2 to 3/4L for at least 3 days.	26.39	High
Lannea microcarpa Eng. & Kr.	<i>Anacardiaceae</i>	Tchembou	Brucellosis	Trunk bark	Powder mixed with water. Give drink "ad libitum" for at least 7 days.	20.83	Mean
Momordica charantia L., 1753	<i>Cucurbitaceae</i>	Baroma	Mastitis	Whole plant	Maceration of crushed whole plant. Give drink about 1/2L 2 times a day for 2 weeks. Or make a mixture of crushed whole plant, water, and a little clay, and apply to breasts every 2 days.	27.78	Low
Nicotiana tabacum L.	<i>Solanaceae</i>	Titaabati	Wounds External parasites	Leaves	Dry leaves powder with added a little water. Apply the mixture on the wound or on the parts affected by parasites every day until complete recovery.	18.05	High

Psidium guayava L.	<i>Myrtaceae</i>	Katikana	Diarrhoea	Leaves	Maceration of crushed leaves. Give drink "ad libitum" for 2 days.	13.89	High
Pterocarpus erinaceus Poir.	<i>Fabaceae</i>	Soonga	Wound Infections, internal parasites	Trunk bark	Powder mixed with a little water. Apply on the wound every day until complete healing. Infusion. Give drink for at least 3 days.	38.89	Mean
Securinega virosa	<i>Euphorbiaceae</i>	Tchékirifa	Constipation Flatulence	Whole plant	Infusion. Give drink about 1/2 L per day for 2 days	19.44	High
Sesamum indicum L.	<i>Pedaliceae</i>	Saari	Avitaminosis Defect of appetite	Grains	Pound the grains. Give the powder to lap. Repeat for 4 to 7 days.	12.5	High
Sorghum bicolor	<i>Graminaea</i>	Soniidé	Anemia Hemorrhagic diarrhoea	Leaves	Infusion of dry leaves. Give drink "ad libitum" for 3 to 4 days in case of diarrhoea and 9 days in case of anemia.	12.5	High
Tamarindus indica L.	<i>Cesalpiniaceae</i>	Mupi	Infections Vomiting	Trunk bark Pulp of fruit	Maceration of crushed bark. Give drink about 3/4L per day for 7 to 9 days. Maceration of pulp of fruit. Give drink "ad libitum" for 2 to 3 days.	29.17	Mean
Tapinanthus spp	<i>Loranthaceae</i>	Titongoré	Paralysis Physical weakness, Somnolence	Stem and leaves	Decoction. Give drink about 1/2L to 3/4L per day until complete recovery.	5.56	Mean
Vitellaria paradoxa C.f. Gaertn	<i>Sapotaceae</i>	Sakintambou	Internal parasites Pasteurellosis	Leaves Trunk bark	Infusion of bark only or mixed with leaves (but not only the leaves). Give drink, about 1L per day for 9 to 12 days.	15.27	High
Ximenia americana L.	<i>Olacaceae</i>	Mirimbou	Avitaminosis Febrility	Fruit	Crush lightly the fruits. Then put to macerate in drinking water by adding a small quantity of "red" salt. Give drink "ad libitum" for 3 to 7 days.	1.39	Low
Xylopia aethiopica (Dunal) A. Rich	<i>Annonaceae</i>	Nandofatcha	Cough Otitis, Ears diseases	Leaves	Infusion. Give drink, about 3/4L per day until complete healing. In the case of ear diseases, in addition to oral administration, put a few drops in the ears.	8.33	Low
Zornia latifolia Sm	<i>Fabaceae</i>	Tampooma	Internal parasites	Whole plant	Infusion. Give drink, about 1L per day for 5 days.	6.94	High

The 37 plant species were distributed in 29 different botanical families, of which the most important are the Fabaceae, the Anacardiaceae, Meliaceae, the Asteraceae, Euphorbiaceae, and Moraceae (Figure 2).

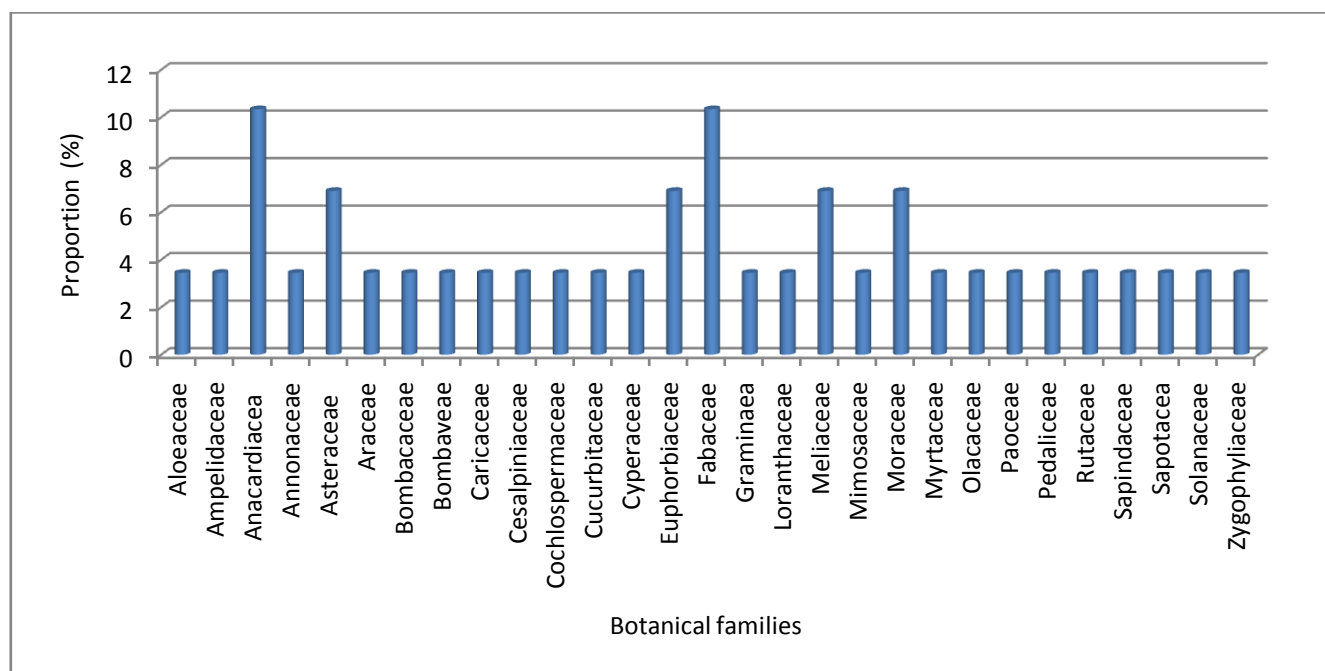


Figure 2: Botanical families of plants used

Note that no endogenous treatment method that is not herbal was cited by the farmers.

Parts or organs used

Different parts or organs of the plant species listed are components of medicinal recipes for the treatment of diseases of Somba cattle. Figure 3 presents the different parts or organs used and their level of use in medicinal recipes. According to this figure, the leaves and bark of the trunk are the most used parts.

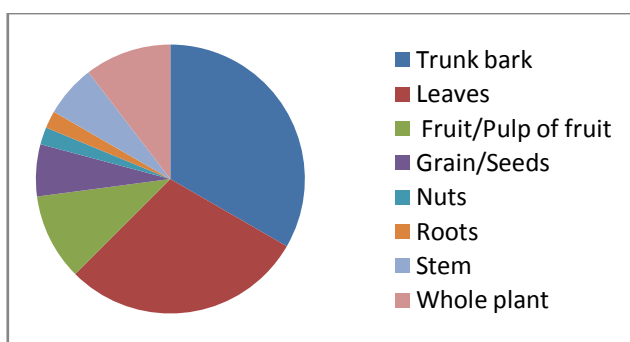


Figure 3: Parts and organs used and their level of use

Methods of preparing of recipes

Seven methods of preparation of medicinal recipes used on the Somba cattle were compiled. Note, however, that infusion and maceration are the most used in the vast majority of cases (Figure 4).

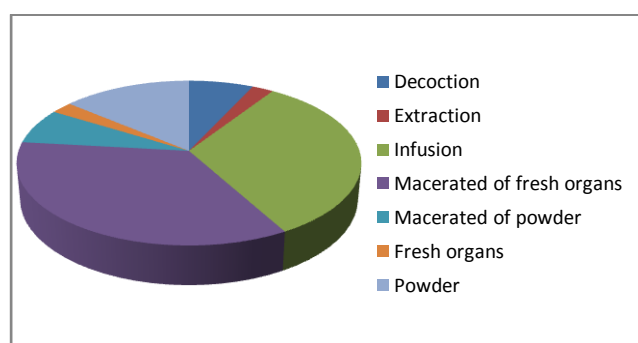


Figure 4: Methods of preparation and their frequency of use

Modes of administration

In the vast majority of cases oral route was used. However, other modes of administration were used such as intranasal, bath, and applying to the different body parts of the animal affected by the disease (Figure 5).

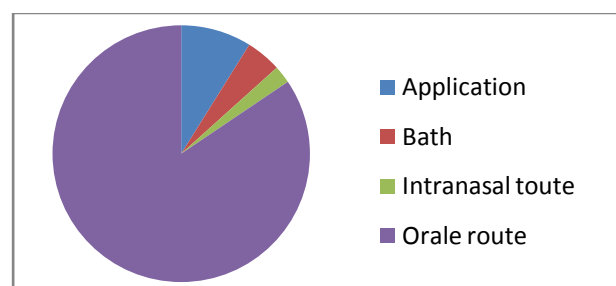


Figure 5: Methods of administration and frequency of use

The most commonly used plants

The application of the Tramil 4 (1994) method, revisited by Deleke Koko et al. (2011), considers a plant as having a high frequency of use if it is cited by at least 20% of the respondents, which allowed us to identify 11 plant species as the treatment of diseases of Somba cattle (Table III).

Table III: Plant species most used

Plant species	Frequency of use (%)
<i>Adansonia digitata</i>	26.39
<i>Azelia africana</i>	22.22
<i>Bridelia ferrugina</i>	22.22
<i>Carica papaya</i>	20.83
<i>Entada africana</i>	25
<i>Khaya senegalensis</i>	41.66
<i>Lanea acida</i>	26.39
<i>Lanea microcarpa</i>	20.83
<i>Momordica charantia</i>	27.78
<i>Pterocarpus erinaceus</i>	38.89
<i>Tamarindus indica</i>	29.17

DISCUSSION

According to our study, farmers who know and practice traditional veterinary medicine are mostly men. This is mainly due to the fact that the study focuses on cattle, and in our traditional African societies, particularly in the north of Benin, ownership and breeding of cattle remain a privilege that accrues to men, including family leaders.

In terms of age, we note the presence of young breeders among practitioners, who are between 20 and 30 years old but who make up a small proportion. The vast majority are breeders between 40 to 60 years. The practice of herbal medicine is passed from father to son to some extent. But it also develops over years of experience in breeding through various exchanges between farmers. It is also indicated in previous studies on medicinal plants (Tamboura et al., 1998; Byavu, 2000; Mehdioui et al., 2007; Koné, 2009; Fah et al., 2013).

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Like these previous studies, our work has identified a large number of diseases treated through traditional herbal medicine. However, in these works the parasitic diseases are not always the most treated as indicated in our results and those of Koné et al. (2006).

Regarding plants repertoried, the diversity of plant species, parts or organs used, botanical families, methods of preparation and administration corroborate the results obtained through other ethnobotanical studies including those conducted by Adjanohoun et al., 1989; Hounzangbé Adoté 1998; Tamboura et al., 1998; Byavu, 2000; Koné et al., 2006; Delvaux et al., 2009; Koné, 2009; Etuk et al., 2010; Allabi et al., 2011; Déléké - Koko et al., 2011; Dibong et al., 2011; Fah et al., 2011; Dossou et al., 2012; Fah et al., 2013, etc. Specifically, our results are consistent with those of these authors on the predominance of bark and leaves as the parts or organs used, infusions and maceration regarding preparation methods, and oral mode regarding modes of administration. Our results are also consistent with those of the authors regarding the botanical families. Indeed, the predominance of certain botanical families such as Fabaceae, the Anacardiaceae, the Asteraceae, and Euphorbiaceae was highlighted by our study, is also mentioned by the works of these authors. As for the plant species identified in our study as being the most used, many are widely cited as widely used by many of the authors cited above; these include, among other plants : *Azelia africana*, *Bridelia ferrugina*, *Carica papaya*, *Khaya senegalensis* *Pterocarpus erinaceus*, and *Tamarindus indica*.

CONCLUSION

This study reveals the existence of a wide range of plant species used in many traditional medicinal recipes to treat the current maladies of Somba cattle in its natural environment. Several types of diseases are treated through these recipes, but it is mostly parasitic diseases that are taken into account.

Through this study we were able to identify and retain the most used plant species, numbering 11 in total. In subsequent work, these plants will be studied chemically, pharmacologically, and toxicologically in order to achieve scientific validation of their use in veterinary medicine.

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